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RECENT PUBLICATIONS.

Tabulæ Reductionum Observationum Astronomicarum annis 1860 *usque ad* 1880 *respondentes, auctore J. Ph. Wolfers: additæ sunt Tabulæ Regiomontanæ annis* 1850 *usque ad* 1860 *respondentes, ab Ill. Zech continuatæ.* Berolini, 1858.

In a preface extending to 72 pages the author explains the construction of the tables contained in the first part of this work, commencing with a statement of the circumstance to which they gave rise. The tables contained in the *Tabulæ Regiomontanæ*, published by Bessel in 1830, serve for the reduction of astronomical observations included between 1750 and 1850; consequently for the computation of ephemerides they ceased to be applicable after the year 1846. Professor Zech accordingly re-calculated the tables down to 1860, using Bessel's elements; and the results, hitherto unpublished, have been employed in computing the apparent places of the stars for the Berlin *Jahrbuch*. These in their turn being exhausted, in so far as the last-mentioned object is concerned, Professor Wolfers has continued the tables from 1860 to 1880. In the execution of this task the author has generally employed new elements of reduction, but he has in all cases strictly adhered to the processes described in the preface to the *Tabulæ Regiomontanæ*, generally using Bessel's own words.

The constant of precession adopted by the author is that given by Bessel in the *Tabulæ Regiomontanæ*, but for the constants of nutation and aberration used in that work he has substituted those of Struve and Peters respectively. Besides Maskelyne's 36 stars, to which the *Tabulæ Regiomontanæ* are confined, the author has included in his tables the additional nine northern stars whose places are given in the Berlin *Jahrbuch*. New values of the mean places of the 45 stars are obtained by a comparison of the results contained in the most esteemed modern catalogues, and those derived from the researches of MM. Peters, Argelander, and Le Verrier.

Professor Wolfers' tables are followed by those of Professor Zech, extending from 1850 to 1860. The elements of these tables are the same as those employed by Bessel. The explanations contained in the introduction to the *Tabulæ Regiomontanæ* are therefore in all respects applicable to them.

Ueber die Reductionstafeln zu den Bessel'schen Zonen, die im XVII$^{\text{ten}}$ *Bande der Königsberger Beobachtungen enthalten sind.** By Dr. Winnecke.

In this paper Dr. Winnecke shows that the reduction-tables to Nos. 497–536 of Bessel's Zones are considerably erroneous.

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In so far as the right ascensions are concerned, the errors seem to have arisen partly from the influence of personal equation not having been taken into account, partly from mistakes committed in the computation of the hourly rate of the clock, but more especially from the effects of instrumental error having been somehow overlooked. The author has computed the following corrections, which must be applied to the right ascensions, computed by means of the reduction-tables contained in Vol. XVII. of the *Konigsberg Observations*:—

Zone.	Date.	D.	Correction.
		°	s
499	1831, April 1	+36	−0·212
501	11	32	−0·179
502	12	20	−0·092
503	22	26	−0·134
505	1832, Jan. 5	40	+0·220
506	Feb. 1	18	+0·087
507	—	28	+0·141
508	2	36	+0·191
509	—	40	+0·220
510	3	42	+0·236
511	4	44	+0·253
512	9	40	+0·220
513	—	30	+0·153
514	11	44	+0·253
515	12	38	+0·205
516	13	42	+0·236
517	14	32	+0·165
518	16	34	+0·178
519	17	40	+0·220
521	21	24	+0·118
522	22	42	+0·236
523	23	26	+0·129
524	28	22	+0·027
525	29	32	+0·055
526	April 11	28	−0·053
527	Nov. 8	38	−0·462
528	21	40	−0·496
529	27	42	−0·533
531	Dec. 24	44	−0·418
532	31	30	−0·238
534	1833, Jan. 7	32	−0·261
535	17	28	−0·199
536	21	+30	−0·219

The author gives the following new values of *k* for the remaining zones:—

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Zone 497.

	h	m	s	
1831, March 26	9	0	−31·681	+618
	9	30	51·063	714
	10	0	30·349	800
	10	30	29·549	868
	11	0	28·681	+922
	11	30	−27·758	

Zone 498.

	h	m	s	
1831, March 27	9	30	−31·623	+604
	10	0	31·019	678
	10	30	30·341	743
	11	0	29·598	+790
	11	30	−28·808	

Zone 500.

	h	m	s	
1831, April 8	9	30	−44·098	+281
	10	0	43·817	327
	10	30	43·490	366
	11	0	43·124	+401
	11	30	−42·723	

Zone 504.

	h	m	s	
1831, May 17	12	30	−70·840	+824
	13	0	70·016	801
	13	30	69·215	+768
	14	0	−68·447	

Zone 520.

	h	m	s	
1832, Feb. 19	5	30	−87·242	−227
	6	0	87·469	128
	6	30	87·597	−211
	7	0	−87·626	

Zone 530.

	h	m	s	
1832, Dec. 15	2	0	+17·010	−635
	2	30	16·375	570
	3	0	15·805	−494
	3	30	+15·311	

Zone 583.

	h	m	s	
1833, Jan. 6	2	0	+8·852	−946
	2	30	7·906	863
	3	0	7·043	−761
	3	30	+6·282	

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The author obtains a confirmation of the results at which he has arrived by instituting a comparison between Bessel's observations and the corresponding star-positions in the catalogues of Johnson, Groombridge, Struve (*Posit. Med.*), and Argelander. Only in the case of zones 528 and 529 does there appear to be any difficulty in accounting for the discordance between the two sets of results.

In regard to the declinations Dr. Winnecke has recomputed the values of *d* for the above-mentioned zones, and obtained the following results:—

Zone 528.

h	m	*d* ″	″
1	0	−174·58	
			+ 8·56
1	30	166·02	
			10·99
2	0	155·03	
			13·27
2	30	141·76	
			+15·49
3	0	−126·27	

Zone 529.

h	m	*d* ″	″
1	30	−163·56	
			+ 9·85
2	0	153·71	
			12·21
2	30	141·50	
			+14·32
3	0	−127·18	

The author remarks in conclusion that in order to obtain the results legitimately deducible from Bessel's zones a careful revision of all the reduction-tables is absolutely necessary.

Sur les Comètes et sur l'Hypothèse d'un milieu Résistant; par M. Faye (*Comptes Rendus, Nov.* 29, 1858).

Remarques présentées par M. le Verrier au sujet de la lecture fait par M. Faye, dans la séance du 29 *Novembre sur les Comètes et sur l'Hypothèse d'un milieu Résistant* (*Comptes Rendus, Decembre* 6, 1858).

In the first of the above-mentioned papers M. Faye adduces various objections to Professor Encke's theory of a resisting medium, and proposes a theory of his own to account for the acceleration of Encke's comet, the existence of which he admits to have been established beyond all doubt by the researches of the distinguished Director of the Berlin Observatory. One of the points upon which he chiefly insists is this: if such a medium exists it is highly improbable that it should wholly escape observation notwithstanding its extreme rarity. In support of this assertion M. Faye computes the quantity of

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matter in a comet upon the basis of a theory due to M. Roche, of Montpelier, in which the dimensions of a comet's atmosphere are deduced from its mass and its distance from the sun. M. Roche takes into account the gravitation of each particle of the cometic atmosphere towards the sun and towards the centre of the nucleus, but neglects the mutual action of the particles, and all consideration of orbital or rotatory motion. It is not difficult from such principles to obtain the radius of the exterior *surface de niveau* of the comet's atmosphere in terms of its mass. Conversely from the observed dimensions of the atmosphere, the same theory enables us to arrive at an approximate value of the mass. Applying these considerations to Donati's Comet, he finds the mean value of its mass to be 0·000000043, the earth's mass being represented by unity, and combining this result with the observed dimensions of the nucleus he finds the mean density to be 0·009, that of air being supposed equal to unity. "Thus," he remarks, "in by far the most compact and brilliant part of the comet's mass, the mean density is hardly nine times greater than that of the vacuum produced in our best air-pumps, although the aggregate mass of the nucleus was not inconsiderable, as we have just seen. However, notwithstanding this extreme rarity, the nucleus shone by a light comparable to that of a star of the second magnitude." M. Faye arrives at still more striking results by applying the same considerations to the tail of the comet. The density of the tail is found by him to be inconceivably less than that of the vacuum produced in our best air-pumps, and yet this part of the comet's structure was distinctly visible, even at its remotest distance from the nucleus. M. Faye hence concludes that if a resisting medium really existed in the planetary regions, it could hardly fail to be visible, notwithstanding its rarity, but no trace of such a medium had hitherto offered itself to the observations of astronomers.

M. Faye further remarks that if the existing medium was endued with a rotatory motion around the sun, it would obviously exercise a different effect on the motion of the comet according as it was direct or retrograde. It would also produce considerable perturbations in the plane of the comet's orbit, unless the latter coincided with the plane of rotation of the medium.

M. Faye accordingly proposes a different explanation of the observed acceleration founded on certain researches of Laplace contained in the *Mécanique Céleste.* In tome IV. page 355, *et seq.*, of that work, the author investigates the effect which would be produced on the motion of a body revolving around the sun, if the solar light be supposed to consist of a series of material particles incessantly emitted from the luminous body. The question had originally suggested itself to the mind of Laplace towards the close of the last century, in the course of his endeavours to account for the secular acceleration of the moon's mean motion. He thus obtained two disturbing forces, one radial and the other tangential. M. Faye makes use of the tangential force to explain the observed acceleration of Encke's comet, and endeavours by means of the radial force, to give an account of the tails of comets in general.

M. Le Verrier, in his reply to M. Faye, remarks that the objection advanced by the latter to the existence of a resisting medium, on the ground of its producing a displacement in the plane of the comet's orbit such as could not fail to be detected by observation, is untenable. With the exception of the mean motion, all the other elements would be affected only in a very inconsiderable degree by the resistance of the medium. Again it was equally unjustifiable to argue against the existence of the medium on the ground of its not being visible. The comet of Encke could be seen only in telescopes of considerable power. It is contrary to all reason therefore to expect that the medium in which the comet revolves, and which must necessarily be much rarer than the comet, could be seen with equal facility. M. Le Verrier finally remarked that in fact M. Faye's hypothesis involved the idea of a *resistance* as well as that proposed by Prof. Encke. In considering the question of the acceleration of a planet by the agency of some cause besides gravitation, Laplace first investigated the effect which would be produced by the *resistance* of a medium pervading the planetary regions; and he remarks that if we adopt the undulatory theory of light, his analyisis would be applicable to the resistance afforded by the luminiferous ether. This is exactly the theory of M. Encke. Laplace next considers the *resistance* which would be produced in the particles of light upon the hypothesis of the corpuscular theory. At a subsequent meeting of the Academy of Sciences, M. Faye has endeavoured to support his speculations by attributing the observed phenomena of comets to the agency of a force directed *from* the sun, and referable to some unknown cause; but we have no space for further details.

Astronomische Beobachtungen auf der Königlichen Universitäts-Sternwarte Königsberg (Drei und dreissigste Abtheilung). Königsberg, 1858.

Besides the usual astronomical observations with the meridian instruments and the heliometer, this volume contains three important disquisitions connected with the operations executed at the Königsberg Observatory. The first is entitled, *Declinationes Stellarum fundamentalium ex ultimis Ill. Bessel Observationibus derivatæ, auctore Eduardo Luther.* The twenty-seventh volume of the Königsberg

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Observations contains the zenith distances of the stars referred to (Maskelyne's 36 stars), derived from observations made by Bessel with Repsold's meridian circle, and reduced to the beginning of 1843 with Peters' Constant of Nutation and Struve's Constant of Aberration. In the present paper Professor Luther has investigated the effects of the flexure of the instrument, and has calculated the coefficients of the equations of condition for obtaining a correction to the mean zenith distance of each star.

The second paper is entitled, *Beobachtungen zur Bestimmung der Längen differenz zwischen den Sternwarten von Berlin und Königsberg in den Jahren* 1856 *und* 1857. This paper contains a systematic treatment, by Dr. Wichmann, of a series of observations made for determining the difference of longitude between Berlin and Königsberg by means of the electric telegraph. The final result indicates the difference of longitude between the centre of the dome of the Berlin Observatory and Reichenbach's Meridian Circle to be $28^m\ 24^s{\cdot}07$.

The third paper is also by Dr. Wichmann. It contains the reduction of observations with the heliometer made between April 23, 1841, and April 30, 1842, for ascertaining the physical libration of the moon. The volume closes with a statement of the meteorological observations made at the Observatory between 1855, October 1, and 1856, April 1.

Annales de l'Observatoire Impérial de Paris, publiées par U. J. Le Verrier, Directeur de l'Observatoire; Observations, tome I. 4to. Paris, 1858.

This forms the commencement of a series of volumes, distinct from those devoted to the investigation of the theories of astronomy, in which M. Le Verrier proposes to include the various observations made at the Imperial Observatory, with their reduction and discussion. In a short preface he gives a brief account of the operations executed at the Paris Observatory during the present century. A regular course of meridional observations was commenced in 1800, and has been continued down to the present time, with the exception of an interruption during the years 1828–34, arising from the unsuitableness of the observing apartments. The observations were published in the *Connaissance des Temps* down to 1810, and subsequently in separate folio volumes, the last of which includes the operations executed at the observatory down to the year 1846. In all these cases the observations were inserted without any accompanying reduction or discussion. M. Le Verrier proposes

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in consequence to supply these deficiencies. The present volume contains the reduction of the meridional observations extending from 1800 to 1829, which were executed under the directorship of M. Bouvard. The introduction contains an explanation, by M. Le Verrier, of the observations and instruments, and of the mode of reduction employed. It also includes an elaborate investigation of the errors of the division of Fortin's Circle by M. Villarceau.

Annales de l'Observatoire Impérial de Paris, publiées par U. J. Le Verrier, Directeur de l'Observatoire, tome quatrième. 4to. Paris, 1858.

This volume commences with an investigation of the theory of the earth's motion. The author then proceeds to consider the geocentric motion of the sun and the measurement of time. In the third section he discusses an immense mass of right ascensions of the sun determined at the observatories of Greenwich, Paris, and Königsberg, between 1750 and 1850. The remaining part of the work is devoted to the construction of new solar tables from these materials, some account of which will in all probability appear in the forthcoming Annual Report of the Council.

Berliner Astronomisches Jahrbuch für 1861, *herausgegeben von J. F. Encke, Director der Berliner Sternwarte, unter Mitwirkung des Herrn Prof. Wolfers.* Berlin, 1858.

In this volume the mean and apparent places of the forty-five standard stars which are usually inserted in the *Jahrbuch*, are for the first time derived from Professor Wolfers' *Tabulæ Reductionum*, &c. At pages 310–11 we find an interesting comparison between the apparent places of the stars thus obtained and the corresponding places computed from Bessel's elements. The Appendix contains a paper by Professor Encke on the existence of a resisting medium, an account of which was given in the *Monthly Notices* for December. We find also in this part of the work the apparent places of the forty-five standard stars for the year 1860, computed from the *Tabulæ Reductionum*, &c., the first of the series of years to which those tables are applicable. The volume concludes with an ephemeris for 1859 of each of the minor planets which come to opposition in this year, and a statement of the elements of all the minor planets.

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Ueber die Verbesserung der Planeten-Elemente aus beobachteten Oppositionen, angewandt auf eine neue Bestimmung der Pallas-Bahn. Von Dr. J. G. Galle. Breslau, 1858.

This paper commences with a brief account of the researches for determining the orbit of *Pallas* since the epoch of its original discovery in 1802. In 1834 the discordance between the observed and calculated places of the planet amounted to as much as 5′ of space, but in 1836 it was found to have diminished. From the nature of the irregularities it was plain that they could not be attributable exclusively to errors in the elements of the orbit, but that their origin must be rather sought for in the effects of planetary perturbation. In correcting the elements of the orbit, the disturbing action of *Jupiter* alone had been taken into account, but the discordances were of too great a magnitude to be explicable by the perturbations of the other planets. It appeared much more probable that they were mainly due to Laplace's value of *Jupiter's* mass, which had been hitherto used in the calculations. The author accordingly corrected the elements anew, by employing in his computation Airy's determination of *Jupiter's* mass $\left(\frac{1}{1048{\cdot}69}\right)$. The groundwork of his investigation consisted of six oppositions of the planet, extending from 1816 to 1836.

Although the error in the computed place of the planet has seldom amounted to as much as 1′ during the 20 years which have elapsed since the period of Dr. Galle's researches just referred to, still it appeared to him desirable to undertake a fresh investigation of the orbit, in order to ascertain to what extent the residual errors in the place of the planet might be diminished by slight changes of the elements, and by substituting for Airy's value of *Jupiter's* mass the slightly different value deduced by Bessel $\left(\frac{1}{1047{\cdot}879}\right)$. This investigation forms the object of the present paper. It is based upon 12 normal places corresponding to an equal number of oppositions of the planet included between 1816 and 1845. Formulæ specially applicable to such observations are given, and the equations of condition are solved by the method of least squares. The agreement between the normal places of the planet and the places calculated from the corrected elements is very satisfactory.

The author has instituted a comparison between his own elements and those assigned by Mr. Farley in the *Nautical Almanac* for 1860, which have been also found to represent the observations of the planet very closely.